Indian and Northern Affairs Canada

Affaires indiennes et du Nord Canada

Northern Affairs Program

THE DIAND NORMAN WELLS
SOCIO-ECONOMIC
MONITORING PROGRAM

REPORT 3-84

Analysis of Rankings of Socio-economic Impacts of the Norman Wells Pipeline Project

Prepared for:

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
Les Terrasses de la Chaudière
Ottawa. K1A 0H4

M.B. Green
University of Western Ontario

and

R.M. Bone
University of Saskatchewan

November 1984

PREFACE

The Norman Wells Oilfield Expansion and Pipeline Project is the first major hydrocarbon development in the North. As such, it offers unique opportunities to observe at first hand the effects of a development project on the environment, the economy and the social fabric of the region. There have been a number of extensive public review processes dealing with major development project proposals, e.g., the Berger Inquiry, and the Environmental Assessment Review Panel (EARP) on the Norman Wells Project itself, which have debated extensively the possible effects of such projects. There have, however, been relatively few opportunities to observe the effects at the time the project is in the construction phase, the time of most likely disruption in a region.

Accordingly, the Department of Indian Affairs and Northern Development mounted a monitoring program with the objective of identifying the impacts, negative and positive, of the Norman Wells Project as development proceeded. The four Mackenzie Valley communities closest to the project are Norman Wells itself, Fort Norman, Fort Simpson and Wrigley. Against the background of a database survey carried out in 1982 intended to provide the picture "before" the start of major construction, the DIAND Norman Wells Socio-Economic Impact Monitoring Program has developed a comprehensive battery of data on certain selected economic and social factors through the conduct of annual field surveys.

This program is, we believe, the first impact monitoring program of its kind, covering as it does the community situations "before", "during" and "after" project construction. The program is under the direction of Professor R.M. Bone of the University of Saskatchewan. Results are being presented in a series of technical reports pertaining to each year for which the survey has been carried out. The present report is designed to provide a comprehensive picture of the program findings from 1982 through 1984. A full list of published reports is presented in the Bibliography.

John Hucker
Director General
Northern Policy and
Coordination

TABLE OF CONTENTS

		Page
	Preface	i
	Executive Summary	v
1.1	Background	1
1.2	Variation in Construction Activity	3
1.3	Positive Impacts	4
2.1	Frequencies and Concordance of Positive Responses	8
2.2	Negative Impacts	13
2.3	Summary of Concordance Measures	18
3.1	Discriminant Analyses of Positive Impacts	19
3.2	Summary of Positive Impact Discriminant Analyses	30
3.3	Discriminant Analyses of Negative Impacts	33
3.4	Summary of Negative Impact Discriminant Analyses	39
4.1	Summary	42
5.1	References	43

LIST OF TABLES

TABLE		Page
1	Detailed List of Positive Project Impacts	5
2	Frequency of Ranking for Positive Project Impacts	7
3	Kendall Concordance Coefficients for Positive Project Impacts	11
4	Detailed List of Negative Project Impacts	14
5	Frequency of Ranking for Negative Project Impacts	16
6	Kendall Concordance Coefficients for Negative Project Impacts	17
7	Stepwise Discriminant Analysis of Sex of Respondents for Positive Project Impacts	21
8	Stepwise Discriminant Analysis of Descent of Respondent for Positive Project Impacts	25
9	Stepwise Discriminant Analysis of Community of Respondent for Positive Project Impacts	27
9a	Discriminant Analysis of Community of Respondent for Positive Project Impacts	28
10	Stepwise Discriminant Analysis of Age of Respondent for Positive Project Impacts	31
11	Stepwise Discriminant Analysis of Sex of Respondent for Negative Project Impacts	34
12	Stepwise Discriminant Analysis of Descent of Respondent for Negative Project Impacts	35
13	Stepwise Discriminant Analysis of Community of Respondent for Negative Project Impacts	37
13a	Discriminant Analysis of Community of Respondent for Negative Project Impacts	38
14	Stepwise Discriminant Analysis of Age of Respondent for Negative Prject Impacts	40

EXECUTIVE SUMMARY

The development of the Norman Wells oil field by Esso Resources Ltd. and the construction of a pipeline by Interprovincial Pipeline (NW) Ltd. to Zama, Alberta is a major project for the Mackenzie Valley region. The Department of Indian Affairs and Northern Development is concerned that socio-economic impacts may occur in four communities located near the pipeline route. These four communities are Norman Wells, Fort Norman, Wrigley and Fort Simpson. Accordingly, this federal Department initiated a socio-economic monitoring program for these four communities in June 1982.

As part of the monitoring program, a single question survey was conducted in these four communities by members of the Federal Coordinator's Office for the DIAND socio-economic monitoring team in March 1984. The responses of 41 local residents are the subject of this report. These responses consist of the perceived positive and negative impacts of the Norman Wells Project on their community.

The March 1984 special survey forms a part of the five year DIAND monitoring program of the Norman Wells Project. The purpose of the March survey was to obtain from local residents their perception of the positive and negative impacts of the Norman Wells Project upon their community. This open ended survey technique allows the respondent to voice his/her concerns without being constrained by a preselected list of possible impacts, such as those prepared by the Environmental Assessment Panel for the Norman Wells Oilfield Development and Pipeline Project. This approach is highly flexible and helps prevent survey bias in the responses. Information on the respondent's age, sex, descent and community of residence were also collected.

Many responses were very similar but were worded slightly differently. This allowed the researchers to classify nearly 400 statements made by local residents into 12 classes of positive impacts and 16 classes of negative impacts. Then these classes were analyzed by means of two statistical techniques, Kendall's coefficient of concordance and discriminant analysis.

The major conclusions found in this paper are:

(1) The proportion of respondents citing two or more positive impacts forms 71% of the total sample while over 90% listed a similar number of negative impacts. Significantly, some 17% did not report a single positive effect of the Norman Wells Project on their community. These findings reflect the fact that there is a sizable minority that strongly opposes this construction project and possibly all forms of industrial development.

(2) The most cited positive impact of the Norman Wells Project is "the provision of jobs, training and economic benefits". Two other positive impacts (increased business and "other" positive benefits) were also mentioned frequently. Social benefits, such as improved community services, were mentioned much less frequently and were ranked much lower than economic benefits.

(3) The most cited negative impact is "the need for more jobs/training". The other frequently mentioned negative factors were (a) too much traffic and noise; (b) not enough business; (c) too much alcohol consumption and crime; and (d) too many southerners. Except for two respondents, everyone cited some negative impacts of the Norman Wells Project and these impacts cover a much greater variety of subjects than the positive impacts.

(4) The four major subgroups are based on age, sex, descent and residence of the respondent. In Kendall's coefficient of concordance analysis, little variation in consistency of responses between these subgroups was observed. In fact, each of the subgroups were more consistent than the entire sample treated as a whole. This finding demonstrates very strongly that perceived project impacts are more uniform among the four subgroups than the sample as a whole. Such a conclusion means that the total sample population is a heterogenous one in terms of impact responses. The implications of this finding for policy-making is considerable.

Further analysis of the four major subgroups was accomplished by discriminant analyses.

(5) Differences between males and females in the ranking of positive impacts include: (a) females rank "no change in liquor consumption" as an important positive benefit while males do not; and (b) females rank "no impact on the town or its services" as well as "sponsorship of community events" as important benefits while males are much more concerned with "good wages and increased business".

(6) Differences between native and non-native subgroups in the ranking of positive impacts of the Norman Wells Project reveals (a) natives rank "good wages" as more important than do non-natives while the reverse is true for "community benefit". This finding suggests that natives see the economic benefits of the Norman Wells Project in a narrow context - as a way of increasing their personal income and strengthening their extended family's financial situation while the non-natives view the project in a broader context - not only affecting them and their immediate family in a positive way but also having wider implications for the growth of their community and Canadian society in general. The failure to mention "native" participation in the Norman Wells Project, such as the securing of contracts from the developers by native corporations and the establishment of a joint venture drilling rig, indicates that the native respondents in this March 1984 survey did not perceive these activities as having a communal impact on native organizations and societies.

(7) Differences between the four communities indicates (a) respondents from Norman Wells rank certain benefits much higher than respondents from the other communities. These positive impacts are (i) sponsorship of community events, (ii) improved community services, and (iii) encouragement of long term development of the community; (b) respondents from Fort Simpson ranked all three of the above mentioned benefits as important but less so than residents of Norman Wells; and (c) respondents from Fort Norman and Wrigley consider these three benefits as less important than both residents of Norman Wells and Fort Simpson. This pattern of responses seems to correspond to the size of community and the proportion of non native respondents, that is, the larger the community and the greater the proportion of non natives, the higher the ranking of these three positive impacts.

(8) Both age groups (those 35 years and younger and those 36 years and older) ranked economic benefits very highly, they disagreed on the importance of providing jobs and training to the local residents. The older group tends to see this type of economic benefit as more important than the younger group.

(9) There was great variation in the responses to negative impacts in the following subgroups - females, non natives and the community of Fort Simpson. This suggests that within these subgroups, there is considerable difference of opinion as to "what" negative impacts from the Norman Wells Project have affected their community.

(10) Men and women tend to disagree on the importance of one negative impact - the need for more jobs/training. Men see more jobs/training as very important while women are less concerned about these two needs. On the other hand, females place much greater importance on social problems, such as racial tension and pressure on community services. This division between the sexes on a "social" versus an "economic" dichotomy agrees with the findings on the analysis of the positive impacts.

(11) Differences by descent are revealed in six negative impacts: the boom-bust cycle of construction; cost/price distortions caused by rapid development; racial tension; overuse of community services; not enough information; and a negative impact on hunting and trapping. The native respondents stress the importance of (a) not enough information on the Norman Wells Project and (b) negative effects of this project on hunting and trapping. The non natives emphasized (a) the boom-bust nature of the project and (b) the cost/price distortion. Racial tension and overused community services are two responses common to both groups.

(12) Differences by place of residence of the respondents brought out seven negative impacts. The seven negative factors are: "other" negative effects; a negative effect on hunting, environmental concerns, too much alcohol consumption and crime; overuse of community services; not enough information about the project; and the length of the construction work is too short. Residents of Norman Wells were concerned about two factors: (a) the overuse of community services and (b) not enough project information. At Fort Norman, the respondents stressed (a) "other" negative impacts; (b) environmental concerns*; and (c) too much alcohol consumption and crime. The communities of Wrigley and Fort Simpson ranked all the impacts as having less importance than at Norman Wells and Fort Norman.

In summary, this study indicates that the subgroups perceive the importance of positive and negative impacts of the Norman Wells project differently and this finding has implications for policy-making. Conversely, the total sample tends to be much more varied in its responses to the issue of impacts, indicating that it is a heterogeneous population.

Finally, the identification and measurement of socio-economic impacts of a major construction project upon local communities is a complex under-

---

*At the time of the March survey, a local environmental problem had been brought to the attention of Fort Norman residents (some oil had been deposited on the ice bridge on Great Bear River and there were fears that this oil would pollute the waters of this river).

taking because these impacts vary according to the attitudes and values of the members of these communities. In the case of the four communities in the Mackenzie Valley, there are sharp differences in attitudes towards northern development and the Norman Wells Project. These differences reflect the dual nature of this population. While the relatively small sample size of this report makes its results indicative rather than definitive, it demonstrates the effectiveness of this approach. Therefore, it is proposed that an impact questionnaire be included in the 1985 field survey season.

1.1 Background

The DIAND socio-economic monitoring program gathers most of its data from an annual survey of all households, businesses and public agencies in the four communities. By its very nature, the questionnaires used in these surveys are very general and are aimed at collecting basic data useful in measuring socioeconomic changes in these communities caused by the Norman Wells Oil Development and Pipeline Project. While information on the main social activities and occupations of household members is being collected, questions referring to sensitive family and community problems, such as alcohol abuse, are not found in the household questionnaire. The main reasons for not including such questions are: (1) the questionnaire was already considered long, (2) complex deep-rooted and sensitive social problems are not well suited to a general questionnaire, and (3) concern that the refusal rate would rise if more questions were asked, particularly ones which might be considered 'offensive'. In our opinion, social problems like alcohol and drug abuse, child neglect and violent deaths, require a specially designed study to properly address these issues.

Socio-economic impacts caused by a mega project can be addressed by survey techniques and in this study the collection of information on social impacts of the Norman Wells Project takes on three forms:

(1) an open ended question on the 1984 Household questionnaires asking the respondent to (a) mark his/her perception of the overall impact of the Norman Wells Project on a Likert scale and (b) list and rank the positive and negative factors causing him/her to come to this decision.

(2) a specially designed questionnaire called Project Impact Survey 1984.

(3) use of secondary data, such as the GNWT Social Services records and community reports of the RCMP; such data on communities permits longitudinal profiles to be constructed and these profiles allow for trend analysis.

In this paper, we wish to examine the results of the second approach - an analysis of responses to a question which allowed local residents to rank negative and positive impacts of the Norman Wells Project. This single question survey of a sample of residents in the four communities was conducted in March and May of 1984. The open ended question was: "In your opinion, what negative effects has the Norman Wells Project had on your community?" and "In your opinion, what positive effects has the Norman Wells Project had on your community?"[1] These responses were designed to produce impact factors for the detailed questionnaire called Project Impact Survey 1984. This questionnaire was designed to analyze these 18 impact factors and to indicate the degree to which each of the major players in this development process are responsible for the particular impact factor.

For several reasons, the specially designed questionnaire was not effective. For this reason, the usefulness of the positive and negative responses from the spring sample survey increased. Two statistical techniques (Kendall Concordance Coefficients and Discriminant Analysis) were used to analyze this data. The purpose of this analysis was (1) to see if this technique would produce useful results and (2) to analyze the results. Overall, we are very pleased with the performance of this type of data and we feel the results provide useful insights on impacts by communities and by various groups of people, such as by sex, by descent and by age. All of this suggests that had the impact questionnaire been

---

[1]The sequence of these two questions was altered so as to eliminate a bias caused by the regularity of asking positive/negative impacts. In the response sheet, people were asked to rank their responses. A copy of the question used in this survey is found in appendix A of report 84-2.

successful, a great deal of very useful information on impact of the project would have been available.

1.2 Variation in Construction Activity

The impact of the Norman Wells construction activity has been most intense at the community of Norman Wells. Preparation work began in early 1982 at Norman Wells. Heavy construction work including extensive quarrying, heavy truck traffic and the construction of artificial islands, all took place near the town site on a round the clock basis. Large numbers of workers lived at specially prepared work camps. At peak construction periods, the permanent residents formed less than half of the total population. This intense construction activity took place from early 1982 to the fall of 1984. From this point in time, the construction work at Norman Wells was 90% completed and the tempo of construction activity was greatly reduced.

The three communities located along the pipeline route were not directly affected by the intense construction work at Norman Wells. The main effect was that some workers commuted from these centers to Norman Wells. Once the pipeline construction took place these communities were more directly involved with the Norman Wells Project. Still, very little actual construction work took place near these town sites as compared with Norman Wells. Furthermore, the two camps located near Fort Norman and Fort Simpson were occupied for a shorter period of time than the camps at Norman Wells. For the most part, the camps were fully occupied for four months - from January to April 1984. In 1985, the pipeline is expected to be completed during the January to April period. From the point of view of direct contact with the Norman Wells Project, residents of Fort Norman and

Fort Simpson had less than Norman Wells while Wrigley had less than either Fort Norman or Fort Simpson.

The importance of this variation in construction impact on the four centers should be reflected in the responses from the residents of the places. Equally important, there are significant differences in commitment to and involvement in the project. For example, Esso and IPL employees probably have the highest commitment to the project and all of them are deeply involved in the project. On the other hand, some of the public employees at Norman Wells would have seen their work load increased and all of them would have had to suffer through the busy, noisy and dusty construction period. Their perception of the Norman Wells project might well not be so positive. Finally, many of the native peoples were not directly involved in the project and some of these people hold strong feelings about development adversely affecting their way of life. Then too there is the issue of native control over the pace and direction of northern development. This issue is linked to the Dene land claims position and this position calls for no development until land claims are settled. Given these attitudes towards development, it is not surprising there is a pattern to the responses and these patterns are the subject of this paper.

1.3 Positive Impacts

These statements of both positive and negative project impacts by local residents were collapsed into twelve classes of positive project impacts and sixteen classes of negative project impacts. The list of positive impacts may be found in Table 1. The respondents' lists of impacts range from no effect on hunters (number 11) to improved community services (number 8) to an improved standard of living (number 5). One of the

TABLE 1

Detailed List of Positive and Negative Project Impacts

Positive Impacts

1. need more jobs, training - includes need more jobs for natives, more jobs for northerners, need more non-union jobs, more training programs, only hired token northerners, unions wouldn't hire northerners, discrepancy between actual and stated hiring practices.

2. provided jobs, training - includes provided jobs for natives, jobs for young people, training programs for natives, economic benefits.

3. other positive effects - includes better government economic aid programs for northerners; northern awareness, i.e., southerners know we're up here; project was well organized; good information provided.

4. increased business - includes more local business, provides experience for local contractors and businesses, provides small businesses with expertise for future.

5. good wages, improved standard of living - includes better standard of living, self-respect provided when earning good money.

6. increased access, cheaper goods - includes better transportation systems, new road, greater transportation frequency, Esso improved road, winter road access, more flights available.

7. no change in liquor consumption, crime - includes drinking was less than what had been expected, same amount of booze and drugs as before project began, haven't noticed any increase in crime.

8. improved services - includes more facilities, some money spent on community projects, better coverage of social services, better government services.

9. encourages long term development - includes provided some sense of long term security and permanence, encouraging other businesses to move in, town will eventually grow with the pipeline going through.

10. no impact on towns, services - includes anticipated negative community impact did not materialize, segregation of camps worked well, no identifiable problem with transients.

11. no effect on hunters, trappers - includes pipeline won't affect trapping as after some period of time no one will know a pipeline is there, realize that I.P.L. had no effect on traplines or hunting.

12. sponsorship of community events - includes curling rink donated by big businesses, they supported merchants' bonspiel.

thirteen positive impacts would seem to be a negative impact; item one, the need for more jobs and training. This seemingly negative impact was included because one individual listed it as being a positive impact. The impact was not excluded from the list of positive impacts because such exclusion would negate part of the desirability of freedom of response garnered from the survey approach.

The frequency of the top five rankings of the positive impacts can be found in Table 2. At this point, several caveats regarding the data are in order. The reader will notice that only twenty-nine respondents (71% of the sample) are included in Table 2. Significantly six of the forty-one respondents did not list a single positive project benefit, while six more could list only one positive benefit. To prevent an undermining of the statistical validity of analyses undertaken later in this report, the six no response and six single response cases were eliminated from further analysis. The reader should thus keep in mind that 29% of the respondents found little or no positive impacts.

The second caveat is that the respondents may have listed one of the twelve "aggregated" impacts multiple times. For instance, item two, the provision of jobs, training, and economic benefits has three distinct components and they may have been listed separately by a respondent, once for jobs, once for training, and once for economic benefits. In such a case, the highest ranked component of item 2 was taken as the rank for all three components. For example, jobs may have been listed or ranked number 1, training ranked as 4, and economic benefits as number 5 in importance. The rank for item two (Table 2) is taken to be 1 and those items ranked 4 and 5 (training and economic benefits respectively) were eliminated from the list. This procedure is undertaken for each set of individual

TABLE 2

Frequency of Ranking for Positive Project Impacts

		Rank						
		1	2	3	4	5	Total	
	Positive Impacts							
1.	provided jobs, training, economic benefits	21	4	1	3		29	100%
2.	other positive impacts	1	5	3	3	1	13	45%
3.	increased business	1	9	2			12	41%
4.	good wages, improved standard of living	2	3	3	2		10	34%
5.	increased access, cheaper goods	1		5		3	9	31%
6.	no change in liquor consumption, crime	1	1	1	1	2	6	21%
7.	no effect on hunters, trappers		3	1	1	1	6	21%
8.	improved services		1	2	1	1	5	17%
9.	no impact on town, services	1		2	1	1	5	17%
10.	encourages long term development	1	2		1		4	14%
11.	sponsorship of community events		1	1	1		3	10%
12.	need more jobs, training			1			1	3%
	Total	29	29	22	14	9	103	

n = 29, 71% of total sample (41)

components comprising an aggregate impact. Thus in the above example, the individual component ranked number 2 would represent itself and all lower ranked members of that aggregate impact. A list of ten individual components might be reduced to four or five aggregate impacts which are then ranked from one to four or five.

2.1 Frequencies and Concordance of Positive Responses

The provision of jobs, training, and economic benefits were listed a total of twenty-nine times making it the most mentioned positive benefit, while increased business and other positive benefits are the second most mentioned. The third and fourth items; good wages, improved standard of living and increased access to the south resulting in cheaper goods are also economic benefits. Non-economic benefits are first mentioned as item 6, no change in liquor consumption or crime. Interestingly, this positive impact is phrased as a continuation of the status quo, suggesting that the concern that liquor consumption and the crime rate would rise sharply during the construction period was unfounded.[2]

In this table, the most positive benefits of the project are seen as economic benefits. Social benefits are mentioned less frequently and are ranked lower than the economic benefits. Also, they are seen as a continuation of pre-construction conditions rather than as an improvement in social conditions.

The column totals show also that the number of people supplying more than two positive project impacts decline rapidly as the number of

---

[2]The Report of the Environmental Assessment Panel for the Norman Wells Oil Development and Pipeline Project recorded the two concerns and this panel made specific recommendations on this subject (REAP, 1981, pp. 63-66 and 79-80).

mentioned impacts increases. Most people therefore named three or less positive impacts of the project.

While Table 2 reveals the overall frequency of responses it does not measure how consistent subgroups of the sample are in their responses. To examine the degree of similarity of response within various groups Kendall's coefficient of concordance (W) is used. Kendall's W is defined as

$$W = \frac{12}{b^2k(k+1)(k-1)} \sum_{j=1}^{k} R_j - \frac{b(k+1)}{2}^2$$

where

b = the number of respondents in a group
k = number of responses
Rj = sum of ranks given for a response j.

The value of W can vary from zero to one. A value of zero indicates perfect disagreement in responses (k) between individuals (b), while a value of one indicates perfect agreement in responses (k) between individuals (b).

The use of the W coefficient leads to the third caveat regarding the data. The respondents when asked to provide a ranked list of positive project impacts provided between zero and seven impacts. After excluding those who answered none or one, as discussed previously, the list of ranked items for a respondent was considerably less than the total of twelve possible items. This meant that a considerable number of items are unranked. A problem arises in that the W coefficient as well as the discriminant analyses used later in this report, require a complete set of rankings for all of the items.

To provide a complete set of rankings for each respondent, the remaining ranks unassigned are randomly allocated among the unranked items.

Because the unused ranks are randomly assigned, there should be no systematic bias in results generated in the analyses. The most probable impact of this procedure is to render conservative coefficient values for both Kendall W and discriminant analyses coefficients.

Table 3 provides a listing of the concordance coefficients for a number of subgroups in the sample. A breakdown of the sample by the respondent's sex shows that the 19 males are marginally more consistent in their responses than are the 10 females. The values of .36 and .35 respectively, show little variation in the rankings of the project impacts. Both values are statistically significantly different than zero, as indicated by the chi-square values and their associated significance levels.[3] For example, the significance level for males of .0001 indicates only one chance in ten thousand of the value of .36 really being zero. This means that one can be confident that the value of .36 is not due to random error. There is therefore a significant level of agreement within the two sex groups. Both groups have a higher value than the entire sample value of .28, indicating differences between the two groups in their responses. The reader should be reminded that Table 3 only deals with ranking of positive project impacts.

The effect of descent of the twenty-nine respondents on rankings of impacts is also found in Table 3. Four groups were defined, non natives, Metis, Status Indians, and a native group consisting of a combination of the Metis group and Status Indian group. Of the four groups, the Status Indians are the most consistent in their responses. The non natives are

---

[3]The chi square formula is a test of the relative distribution of observations among different categories, such as the positive impact factors in Table 2. Generally speaking, the higher the chi square value, the greater the level of significance.

TABLE 3

Kendall Concordance Coefficients[1] for Positive Project Impacts

	Coefficient[2]	Chi-square Significance	N
Sex			
Male	.36	.00	19
Female	.35	.00	10
Descent			
Non native	.37	.00	13
Metis	.32	.05	6
Status Indian	.40	.00	10
Native (Metis, Status)	.31	.00	16
Community			
Norman Wells	.38	.03	6
Fort Norman	.43	.03	5
Wrigley	.41	.01	7
Fort Simpson	.39	.00	11
Age			
0 - 35	.24	.00	11
36 - above	.36	.00	16
Missing cases			2
Entire Sample	.28	.00	29

[1] 12 degrees of freedom

[2] The value one indicates perfect agreement in responses between individuals while a zero indicates perfect disagreement. While these two values are possible, their occurrence is extremely rare. This fact does not diminish the utility of Kendall concordance coefficient. For example, the values of .36 for males and .35 for females means that both sexes have a similar consistency in their responses (or a similar degree of variation).

slightly less consistent as shown by a value of W = .37. The Metis group has a W of .32. The combined native group has the lowest W value at .31 that is also statistically significant. The results suggest that based on the concordance coefficients when compared to the coefficient for the entire sample substantial differences between responses among the non native and native groups exist. However, the W value for the native group indicates that the Metis and Status Indian groups are not substantially different. These two groups can therefore be aggregated together.

All four communities, Norman Wells, Wrigley, Fort Simpson and Fort Norman exhibit statistically significant concordance coefficients. The values of all four of the communities when compared to the coefficient for the entire sample are all larger. These larger values indicate that the communities have different sets of perceptions of project benefits. Perceived project benefits are therefore geographically localized, and policy decisions must address individual communities. The communities can not be treated as a homogeneous whole.

The effect of the age of the respondents on rankings of impacts is also addressed. The age structure was arbitrarily divided into two groups, those over 35, and those 35 and younger. This division is based in part on those who more likely have experienced some portion of the modernization process in the North in their youth, the 35 and younger group.

The concordance coefficients for both groups are significantly different than zero. The older group is somewhat more consistent in response than the younger group. The older group is more concerned with the possibility of improved wages and the "no effect" on hunting than the younger group. The younger group agrees with the older group on the importance of more jobs but shows little internal consistency otherwise.

2.2 Negative Impacts

The perceived negative impacts of the pipeline project as aggregated from the respondent's listings are found in Table 4. As in the case of the perceived positive impacts, the list covers a variety of subjects. In contrast to the positive impact case, forty of the forty-one respondents named at least two negative impacts.

The frequencies of rankings for negative project impacts are listed in Table 5. The most commonly listed item is the need for more jobs and training (item 1). The second most frequently cited disadvantage is too much traffic and noise (item 2), followed by not enough business (item 3). Too much alcohol and crime (item 4), along with too many southerners and transients (item 5) follow closely as frequently mentioned negative impacts. It is interesting to note that in contrast to the positive benefit table, the most commonly mentioned negative impacts are social ones. This is an interesting dichotomy of positive economic benefits versus social costs. For example, while the construction project generated many high paying jobs for a short period of time, the main negative item includes the need for more jobs. This suggests (a) the need for jobs after the construction period and/or (b) a failure in local residents obtaining jobs.

As in the positive impact analysis, it is desirable to examine the consistency of response within subgroups of the sample. Table 6 lists the Kendall coefficients of concordance (W) for the rankings of negative impacts. As in the benefit table the 24 males are more consistent in rankings than are the 18 females. The female group has a low coefficient that is not significantly different than zero, indicating little agreement within the group regarding project drawbacks.

Negative Impacts

1. need more jobs, training - includes need more jobs for natives, more jobs for northerners, need more non-union jobs, more training programs, only hired token northerners, unions wouldn't hire northerners, discrepancy between actual and stated hiring practices.

2. not enough businesses, long term benefits - includes not enough business brought to the communities, promises re. contracting work weren't kept, no long term benefits to economy of the communities.

3. other negative effects - includes jobs too difficult, money earned as wages not being spent on family, contracts should go through co-op rather than band, fosters negative attitude towards large development projects.

4. too much alcohol, crime - includes too much alcohol at the camps, drugs and alcohol too readily available, vandalism, no control over liquor in camps, too much gambling at camp.

5. too much traffic, noise - includes too many vehicles in town, danger to children on roads, too much noise from trucks running overnight, too much traffic through town at night, hazardous vehicles.

6. environmental concerns - includes concern about water quality once pipeline construction occurs in Great Bear River, concern over pipeline spills, damage along right of ways, artificial islands affect natural river breakup.

7. too many southerners, transients - includes too many southerners encouraged to commute and they leave nothing in the community, no spending here; greater transient population.

8. project duration too short - includes project could have been spread out longer, jobs were too short, should have been expanded over 3 to 4 years rather than 2 to give more businesses a chance to set up.

9. services overused - includes schools, banks, health services overused, recreation facilities overused.

10. not enough information - includes not enough information provided regarding jobs, the project, union operations provided to the public, not enough public relations.

11. negative effect on hunting, trapping - includes disturbance along trapline hurts trappers; right of way will interfere with hunting trails.

12. boom and bust, social stress - includes ruined community feeling, too much commotion, preoccupation with money, during construction residents felt like outsiders.

13. price inflation - includes higher costs due to greater demand, costs of rent and food have risen, costs in town are very high, once exploration started prices started going up.

14. racial tension - includes racial discrimination, anti-white sentiment, natives given the dirtiest jobs.

15. costs incompatible with local businesses - includes local businesses can't afford to pay same wages as the big companies, therefore they can't compete, high wages are inflating peoples' idea of what they are worth, heavy staff turnover, too much capital outlay for small contracts to get into something.

16. native way of life disrupted - includes project is hindering the native way of life as the animals and fish are moving away; money spent on alcohol and retreat from native lifestyle occurs; many native people moving away from traditional lifestyle.

TABLE 5

Frequency of Ranking for Negative Project Impacts

		Rank					Total	
		1	2	3	4	5		
1.	need more jobs, training	9	12	2	2	2	27	68%
2.	too much traffic, noise	4	3	1	6	4	18	45%
3.	not enough business, long term benefits	4	2	5	4	1	16	40%
4.	too much alcohol, crime	3	4	6	1	1	15	38%
5.	too many southerners, transients	2	2	5	4	2	15	38%
6.	other negative impacts	6	2	2	1	3	14	35%
7.	boom and bust, social stress	1	3		2	4	10	25%
8.	services overused	1	2	4	2		9	23%
9.	environmental concerns	4	1	2	2		9	23%
10.	project duration too short		2	1	2	3	8	20%
11.	negative effect on hunting, trapping	4	1		1	2	8	20%
12.	not enough information			4	2		6	15%
13.	price inflation	1	2			2	5	13%
14.	cost-price distortions	1	2	2			5	13%
15.	racial tension		1		1	1	3	8%
16.	native way of life disrupted		1	1			2	5%
	Total	40	40	35	30	25	170	

n = 40, 98% of sample

TABLE 6

Kendall Concordance Coefficients[1] for Negative Project Impacts

	Coefficient	Chi-square Significance	N
Sex			
Male	.16	.00*	22
Female	.08	.00**	18
Descent			
Non native	.08	.20	15
Metis	.28	.01	8
Status Indian	.20	.00	16
Native (Metis, Status, and Non Status Indian)	.16	.00	25
Community			
Norman Wells	.19	.01	10
Fort Norman	.33	.00	12
Wrigley	.24	.01	8
Fort Simpson	.13	.08	10
Age			
0 - 35	.10	.01	14
36 - above	.13	.00	24
Missing cases			2
Entire Sample	.28	.00	40

[1] 15 degrees of freedom

*Significance values less than .05 denote highly significant coefficients. There is less than a 5% chance of error.

**Significance values greater than .10 but less than or equal to .20 are not statistically significant. There is up to a 20% chance of error.

With regards to the descent groups, the situation is the reverse of the positive impact case. The non native group has an insignificant W value, while the native groups all exhibit significant coefficients. Again the separation between natives and non natives is apparent. The native respondents rate too much alcohol and crime, too much traffic and noise, and too many southerners and transients as more important than do non natives. It is the consistency of response on these items that set the native group apart.

Three of the four communities have significant coefficients. Norman Wells, Fort Norman, and Wrigley exhibit some internal agreement in impact rankings. In all four cases, the communities exhibit higher internal consistency than does the entire sample as a whole. The individuality of community perceptions is again apparent.

The two age groups exhibit some differences in coefficients between them. The coefficients are approximately the same as the W coefficient for the entire sample, indicating little difference in response between the two groups.

2.3 Summary of Concordance Measures

An evaluation of the respondents' ranking of positive project impacts has revealed a number of interesting findings. First, only twenty-nine of the forty-one respondents cited two or more positive impacts. A third of the sample listed none or one positive impact.

The provision of jobs, training, and economic benefits was listed as the most cited positive impact. Two other impacts, increased business and other positive benefits are also prominently mentioned. Non economic benefits seem to be rated less important by the sample of respondents. The

social benefits which are named are seen as a continuation of pre-construction conditions rather than improvements.

There is little variation in consistency of responses when comparing males and females. The same is true when examining descent subgroups, as well as a breakdown of responses by community and age group. Interestingly each of the subgroups are more consistent than the entire sample treated as a whole.

The internal consistency of the subgroups indicates that each is distinct in its responses and that it would be a mistake to treat the sample as a homogeneous whole. Project benefits are thus ethnically, geographically, sex, and age specific.

The number of respondents citing more than one negative impact was forty out of forty-one or 98% of the sample. The most commonly cited negative impacts cover a greater variety of subjects than do the rankings of the positive benefits. The most often listed item is the need for more jobs and training followed by too much traffic and noise. Other impacts often mentioned are; not enough business, too much alcohol and crime, and too many southerners. The most commonly mentioned negative impacts are social impacts.

3.1 Discriminant Analyses of Positive Impacts

The overall perceived importance of the project impacts as well as the consistency of responses within sample subgroups have now been examined. The subgroups have generally been shown to be meaningful as a division of individuals. The next facet of the rankings of project impacts deals with those impacts that are ranked significantly differently between the previously described subgroups. To accomplish this, recourse is made to discriminant analysis.

Discriminant analysis is a multivariate linear statistical technique. The technique is designed to statistically distinguish between two or more groups. To distinguish between groups, a number of discriminating variables are chosen. The values of these variables are utilized in a discriminant function.

A discriminant function is of the form

$$D_i = C_{i1}Z_1 + C_{i2}Z_2 + \ldots + C_{ip}Z_p$$

where

D_i = is the score on discriminant function i
D_{ip} = weighting coefficient of function i for variable p
Z_p = standarized values of the p discriminating variables utilized in the analysis.

Ideally, the discriminant scores for individuals within a group are all of a similar value, while the differences in the average discriminant score between groups is maximized. Discriminant analysis will therefore make use of variables that exhibit different values on average for different groups. Variables that have little variation between groups, while important in understanding the groups, will not be used to distinguish between them.

A stepwise discriminant analysis of positive project impacts by sex is detailed in Table 7. The analysis is called stepwise because the variable with the greatest ability to distinguish between groups is included in the discriminant function first, the variable with the second greatest discriminatory power is entered second and so on.

A number of other terms need explanation before the table can be properly interpreted. Wilks lambda is a measure of how well the discriminant function can distinguish between groups. Wilks lambda can vary from zero to one, with lower values indicating greater discriminatory power. For instance, the Wilks lambda for sponsorship of community events

TABLE 7

Stepwise Discriminant Analysis of Sex of Respondent
for Positive Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Good wages, improved standard of living	.81	.02	1.03
2. Increased business	.57	.00	.77
3. Sponsorship of community events	.50	.00	-.43
4. No impact on town or services	.48	.00	-.48
5. No change in liquor consumption	.47	.00	-.57

Canonical Correlation	Wilks Lambda	Significance
.73	.47	.00

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Male	Female
Male	19	14 73.7	5 26.3
Female	10	2 20.0	8 80.0

Percent of Grouped Cases Correctly Classified - 76

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Male	-.75
Female	1.42

is .50. This relatively low value indicates that the discriminant function utilizing the rankings on no change in liquor consumption or crime, good wages, and increased business is able to distinguish between groups reasonably well. The significance level of .00 indicates the value of Wilks lambda is significantly different than zero and this means the results are valid statistically.

The standardized discriminant function coefficients indicate the importance each of the included variables has on the discriminant score for an individual case. If the sign of the coefficient is ignored, the greater the value of the coefficient the greater the impact of that variable on discriminant scores. The discriminant scores are the values generated by the discriminant function used to classify individual cases into a group. The coefficients are expressed in standard deviations. For example, increased business has a function coefficient of .77, meaning that for every increase in the standarized value of the rank above the mean rank given by an individual, the discriminant score will be increased by a value of .77.

The canonical correlation coefficient is yet another measure of how well the discriminant function is able to distinguish between groups based on the rankings of impacts provided. The correlation coefficient can vary from zero to one. The closer the value is to one the better the discriminant function performs. The canonical correlation coefficient of .73 also indicates the function can discriminate among groups reasonably well.

The classification results show how well the discriminant function performs in classifying individuals into groups based on project impact rankings. In this case, 76% of the cases are correctly classified, a success rate far better than that which could be achieved by chance.

Table 7 so far has revealed those impacts that are ranked differently between groups, how well these rankings distinguish between groups, the order of ability of the variables to distinguish between groups, as well as their relative importance in a discriminant function.

Given all of this information, the question still remains: which group or groups rank an impact as important and which rank it as relatively unimportant? To answer this question, reference must be made to the group means and the standardized discriminant function coefficients. The value of the group means indicates how far away the group is from zero in either a positive or negative direction. When the discriminant function is used to generate a discriminant score, the score is compared to the group means. The individual is classified into the group whose mean is closest to the value of the generated discriminant score. An individual with a discriminant score of -.46 would be classified as a male in this example using Table 7.

Since the function coefficients indicate the effect of the ranking of an impact on the discriminant score, they reveal how the two groups rank that particular impact. The discriminant function coefficient for no change in liquor consumption or crime for instance is -.57 while males have a group mean of -.75 (Table 7). This indicates that males in general rank liquor consumption as a relatively unimportant project impact. Remember that the higher the value of the rank the less important the impact is perceived, and that the standarized form of the data is input into the discriminant function. A rank of 15 for instance will tend to create a discriminant score with a negative value. The discriminant function coefficient is negative and is coupled with rank value which because it is above the mean rank carries a positive sign. The function coefficient

(negative in sign) multiplied times the standardized score (positive in sign) yields a negative value.

Standarized scores are defined by

$$Z_i = \frac{X_i - \bar{X}}{s}$$

where

Z_i = standardized score
X_i = value of rank
$\bar{X}$ = mean rank
s = standard deviation.

Values of ranks below the mean will be negative in sign when standardized, while values of ranks above the mean will be positive in sign.

Therefore, an examination of discriminant function coefficients and the group means reveal that females perceive no change in liquor consumption or crime, sponsorship of community events and no impact on town or services as more important than do males. Males on the other hand, perceive increased business and good wages as more important than do females. Substantial disagreement exists between the sexes on the relative importance of these project benefits.

A similar analysis is undertaken for the two groups defined by the descent of the respondent (Table 8). The discriminant function includes only three impacts, other positive effects, good wages, and sponsorship of community events. The three impacts have function coefficients significantly different than zero, while the function has a Wilks lambda of .59 and a canonical correlation of .64. The classification results show 79% of the cases are correctly classified, a better rate than would be achieved by chance.

An examination of the group means and function coefficients shows that non natives perceive other positive effects and sponsorship of community

TABLE 8

Stepwise Discriminant Analysis of Descent of Respondent for Positive Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Other positive effects	.74	.00	.90
2. Good wages	.63	.00	-.59
3. Sponsorship of community events	.59	.00	.38

Canonical Correlation	Wilks Lambda	Significance
.64	.59	.00

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Non native	Native
Non native	13	11 84.6	2 15.4
Native	16	4 25.0	12 75.0

Percent of Grouped Cases Correctly Classified - 79

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Non native	-.88
Native	.71

events to be more important than do natives. Natives on the other hand perceive good wages as more important than do non natives. Such a result is not unexpected given the relative economic conditions of the two groups. Natives see the project as a way of improving their economic situation.

The discriminant analysis of the four communities is a little more difficult to interpret than the two group cases. In using discriminate analysis it is possible to generate n - 1 discriminate functions, where n is the number of groups. Thus for four groups three functions can be generated.

Table 9 shows the statistics for the three generated discriminant functions for completeness, but only one of the functions is statistically significant. Table 9a provides details on the discriminant analysis using the single significant discriminant function. Subsequent analysis will utilize only the one significant function.

The four communities differ significantly on their rankings of project benefits on sponsorship of community events, improved service, and encouragement of long-term development. The most important impacts in determining discriminant scores are sponsorship of community events, and improved services, both in terms of discriminatory power and in the sizes of their function coefficients. Individuals residing in Norman Wells would tend to rate all three impacts as quite important, while residents of Wrigley tend to rate all three less important compared to residents of Norman Wells. The residents of Fort Simpson rank all three impacts as important but less so than residents of Norman Wells, but more than residents of Fort Norman. The exact order of importance of rankings for the communities is difficult

TABLE 9

Stepwise Discriminant Analysis of Community of Respondent for Positive Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients Func 1	Func 2	Func 3
1. Sponsorship of community events	.69	.02	1.08	.26	-.39
2. Improved services	.44	.01	.72	-.61	.51
3. Encourages long term development	.37	.02	.68	.74	.60

Canonical Correlation	Wilks Lamda	Significance
1. .73	.41	.00
2. .32	.88	.53
3. .13	.98	.50

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Norman Wells	Fort Norman	Wrigley	Fort Simpson
Norman Wells	6	5	0	0	1
		83.3	0	0	16.7
Fort Norman	5	1	1	2	1
		20.0	20.0	40.0	20.0
Wrigley	7	0	3	3	1
		0	42.9	42.9	14.3
Fort Simpson	11	2	2	3	4
		18.2	18.2	27.3	36.4

Percent of Grouped Cases Correctly Classified - 45

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1	Function 2	Function 3
Norman Wells	-1.74	-.18	-.07
Fort Norman	.80	-.57	.11
Wrigley	1.04	.09	-.18
Fort Simpson	-.07	.30	.11

TABLE 9a

Discriminant Analysis of Community of Respondent
for Positive Project Impacts

One Function

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients Function 1
1. Sponsorship of community events	.69	.02	1.09
2. Improved services	.44	.01	.76
3. Encourages long term development	.37	.02	.68

Canonical Correlation	Wilks Lamda	Significance
.73	.88	.00

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Norman Wells	Fort Norman	Wrigley	Fort Simpson
Norman Wells	6	5	0	0	1
		83.3	0	0	16.7
Fort Norman	5	0	1	2	2
		0	20.0	40.0	40.0
Wrigley	7	0	1	5	1
		0	14.3	71.4	14.3
Fort Simpson	11	2	2	2	5
		18.2	18.2	18.2	45.5

Percent of Grouped Cases Correctly Classified - 55

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Norman Wells	-1.75
Fort Norman	.81
Wrigley	1.03
Fort Simpson	-.07

to determine since all the standardized discriminant function coefficients are positive.

The reader may be puzzled at this point, as to how negative group means such as -1.75 for Norman Wells can be generated by coefficients with only positive signs. Standardized coefficients use standardized data values in their generation of discriminant scores. A standardized datum will be of a negative sign if it is below the mean in value. Therefore, rank values of one to six will be of a negative sign in standardized form (the mean of twelve ranks is 6.5). Therefore, when residents of Norman Wells rank the three impacts with rank values of one to six, they generate negative discriminate scores.

The classification results show that the single discriminate function was able to correctly classify 55% of the time, a considerable improvement over random chance. Fort Simpson was the community most difficult to correctly classify, indicating disagreement within the community regarding the importance of the three impacts.

The examination of the two age groups revealed four impacts that distinguish between people 35 years and younger and those over 35 years of age. The four impacts are the need for more jobs and training, the provision of jobs, training, and economic benefits, increased business, and the encouragement of long term development. Of these four only the need for more jobs and training, and the provision of jobs, training and economic benefits are significant at the 5% level. Proceeding using only the two significant impacts, we further drop the need for more job and training from consideration. The impact is mentioned by only one person and is significant only because of the small size of the sample (n = 27).

Thus only the provision of jobs, training, and economic benefits will be considered further.

The function coefficient and group means reveal that those over 35 years of age tend to rank the provision of jobs and training more important than their younger counterparts. However, Table 10 also shows that the younger group rates increased business and long term development more important, if one uses the two insignificant impacts.

The classification results show that 79% of the cases were correctly classified. This is compared to the success rate one would get if everyone were put in the most numerous category, those over 35 (55% correct). Thus knowing how someone ranks the four impacts of the need for more jobs and training, the provision of jobs, training and economic benefits, increased business, and the encouragement of long term development, allows one to successfully predict their age group 79% of the time. The rankings of the four impacts vary sufficiently between the two groups that predictions can be made upon them.

3.2 Summary of Positive Impact Discriminant Analyses

The discriminant analyses of the project impacts allow for more insight into differences in assessment of impacts between the previously defined subgroup. The positive project impacts are found to be ranked differently depending on a particular subgroup.

Females for instance rank no change in liquor consumption as an important positive benefit while males do not. Females also rank no impact on the town or services as well as sponsorship of community events as being important. Males on the other hand are more concerned with economic

TABLE 10

Stepwise Discriminant Analysis of Age of Respondent for Positive Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Need more jobs, training	.84	.03	1.10 (.94)*
2. Provided jobs, training, economic benefits	.79	.05	-.44 (-.56)*
3. Increased business	.74	.06	.53
4. Encourages long term development	.70	.06	.51

Canonical Correlation*	Wilks Lambda	Significance
.43	.79	.05

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Over 35	Predicted Group Membership: 35 and Under
Over 35	16	12 75.0	4 25.0
35 and under	13	2 15.4	11 84.6

Percent of Grouped Cases Correctly Classified - 79

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Over 35	.45
35 and under	-.55

*coefficient for function with only first two impacts included

benefit of good wages and increased business. It is clear perceptions of the importance of positive impacts differs between the sexes.

Subdivision into non native and native group reveals non natives perceive other positive effects and sponsorship of community events as more important than do natives. Natives rank good wages as more important. Such a result indicates natives see the project as a way of improving their economic condition.

Individuals residing in the four communities of Norman Wells, Fort Norman, Fort Simpson, and Wrigley differ significantly in their assessment of positive benefits. The differences exist primarily for sponsorship of community events, improved services, and encouragement of long term development.

Norman Wells residents rate all three impacts as important, while Wrigley residents less so. Residents of Fort Simpson rank all three as important but less so than residents of Norman Wells, but more so than Fort Norman residents. Again the geographic specificity of impacts is highlighted.

The over 35 years of age and 35 and under age groups disagree only on the importance of the provision of jobs and training. The older group tends to see this impact as more important than does the younger group. Remember, however, that all respondents rank economic benefits highly.

The subgroups of females, non natives, and the community of Fort Simpson are inconsistent in ranking negative impacts. In fact all subgroups are less consistent in response. This indicates little agreement about negative impacts.

However, the community, sex, and descent subgroups are again distinct in responses when compared to the entire sample. Impacts are subgroup

specific, indicating policy responses must also be subgroup specific. The subgroups utilized can therefore be seen as a meaningful aggregation of individuals.

3.3 Discriminant Analyses of Negative Impacts

The analysis of the rankings of the negative project impacts begins with a discriminant analysis of sex defined groups (Table 11). The need for more jobs and training is the first impact to enter on the stepwise analysis, indicating it has the greatest discriminatory power of any single variable. It is followed by; environmental concern, boom and bust, project duration too short, social tension, services overused, and too much traffic, all of whose Wilks lambdas are significantly different than zero.

The canonical correlation and Wilks lambda for the discriminant function indicates the function has a respectable amount of discriminatory power. The classification results are also reasonable, with 75% of the cases correctly classified.

The function coefficients and group means show that males see more jobs and training as quite important compared to women. Females tend to place greater importance on social problems, such as racial tension and overuse of services. This division between the sexes on a social versus economic dichotomy agrees with the findings on the analysis of the positive impacts.

Six impacts have discriminatory power when examination of descent is undertaken (Table 12). The six are largely social problems, with the exception of a negative impact on hunting and trapping, and cost-price distortions. The canonical correlation and Wilks lambda of the discriminant function indicates a fair degree of discriminatory power, as does the correct classification of 78% of the cases.

TABLE 11

Stepwise Discriminant Analysis of Sex of Respondent
for Negative Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Need more jobs, training	.86	.01	-.46
2. Environmental concerns	.80	.01	.68
3. Boom and bust, social stress	.74	.01	.74
4. Project duration too short	.72	.01	.50
5. Racial tension	.70	.02	.48
6. Services overused	.67	.02	.58
7. Too much traffic, noise	.63	.02	.52

Canonical Correlation	Wilks Lambda	Significance
.60	.63	.02

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Male	Predicted Group Membership: Female
Male	22	17 77.3	5 23.0
Female	18	5 27.8	13 72.2

Percent of Grouped Cases Correctly Classified - 75

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Male	.63
Female	-.84

TABLE 12

Stepwise Discriminant Analysis of Descent of Respondent for Negative Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Boom and bust, social stress	.88	.02	.82
2. Cost-price distortions	.74	.00	.70
3. Racial tension	.67	.00	.54
4. Services overused	.62	.00	.46
5. Not enough information	.62	.00	-.32
6. Negative effect on hunting, trapping	.60	.00	.30

Canonical Correlation	Wilks Lambda	Significance
.62	.60	.00

Classification Results

		Predicted Group Membership	
Actual Group	No. of Cases	Non native	Native
Non native	15	10 66.7	5 33.3
Native	25	4 16.0	21 84

Percent of Grouped Cases Correctly Classified - 78

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Non native	-1.05
Native	.58

The native population tends to stress the importance of not enough information and the negative effects on hunting and trapping. The non natives tend to place greater importance on the boom bust nature of the project, and the effect of cost and price structure distortions generated by the project. The rankings of social tension and overused services are not clear cut. These impact rankings tend to agree with those found in the analysis of the rankings of positive impacts by descent.

The communities have different attitudes about the rankings of seven negative impacts (Table 13). The first discriminant analysis generated three discriminant functions only one of which is statistically significant. Table 13 is therefore presented for completeness sake only. Table 13a presents the results for the one significant discriminant function.

The value of the canonical correlation coefficient and Wilks lambda show the function has relatively strong discriminatory ability. This is further substantiated by the classification results with 55% of the cases correctly classified.

Seemingly the residents of the community of Norman Wells place importance on the negative effect on hunting and trapping. This result is spurious in that only eight people identified this as an impact, one of which was a non native residing in Norman Wells. Because of the small size of the Norman Wells response group (10 persons), and the uniqueness of the single non native, the discriminant analysis procedure will use the impact enabling it to correctly classify 10% of the sample (1 person). Residents of Norman Wells rank overuse of services as well as not enough information impacts as meaningful. The residents of Fort Norman place much less importance to the above factors, but great importance on other negative effects, environmental concerns and too much alcohol and crime. The

TABLE 13

Stepwise Discriminant Analysis of Community of Respondent for Negative Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients Func 1	Func 2	Func 3
1. Other negative effects	.68	.00	.83	.17	-.56
2. Negative effect on hunting, trapping	.50	.00	-.38	.43	.29
3. Environmental concerns	.39	.00	.94	.03	.43
4. Too much alcohol, crime	.28	.00	.72	-.13	.59
5. Services overused	.23	.00	-.31	-.30	-.21
6. Not enough information	.21	.00	.14	.67	.18
7. Project duration too short	.19	.00	.34	.38	.17

Canonical Correlation	Wilks Lamda	Significance
.78	.19	.00
.63	.50	.01
.39	.84	.30

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Norman Wells	Fort Norman	Wrigley	Fort Simpson
Norman Wells	10	9	0	0	1
		90.0	0	0	10.0
Fort Norman	12	0	9	2	1
		0	75.0	16.7	8.3
Wrigley	8	0	1	4	3
		0	12.5	50.0	37.5
Fort Simpson	10	1	1	1	7
		10.0	10.0	10.0	70.0

Percent of Grouped Cases Correctly Classified - 78

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1	Function 2	Function 3
Norman Wells	1.48	.95	-.18
Fort Norman	-1.61	.55	.18
Wrigley	-.46	-.83	-.70
Fort Simpson	-.68	-.79	.43

TABLE 13a

Discriminant Analysis of Community of Respondent for Negative Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients Function 1
1. Other negative effects	.68	.00	.83
2. Negative effect on hunting, trapping	.50	.00	-.38
3. Environmental concerns	.39	.00	.94
4. Too much alcohol, crime	.28	.00	.73
5. Services overused	.23	.00	-.31
6. Not enough information	.21	.00	.14
7. Project duration too short	.19	.00	.35

Canonical Correlation	Wilks Lamda	Significance
.78	.50	.02

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Norman Wells	Fort Norman	Wrigley	Fort Simpson
Norman Wells	10	8	0	0	2
		80.0	0	0	20.0
Fort Norman	12	0	8	3	1
		0	66.7	25.0	8.3
Wrigley	8	0	2	3	3
		0	25.0	37.5	
Fort Simpson	10	3	0	3	4
		30.0	0	30.0	40.0

Percent of Grouped Cases Correctly Classified - 56

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Norman Wells	1.49
Fort Norman	-1.61
Wrigley	-.46
Fort Simpson	-.68

communities of Wrigley and Fort Simpson exhibit medium levels of importance for all of the listed project impacts. The reader should be cautious because the concordance coefficients (Table 6) show low levels of agreement within these communities. Therefore, the results given in Table 13 and 13a are somewhat suspect.

The last portion of the analysis of the rankings of project impacts deals with the division of the sample by age (Table 14). As in the case of the analysis of the age groups for positive impacts, the canonical correlation coefficients, Wilks lambda, and the percent correctly classified, do not indicate a discriminate function of much strength in discriminatory power (Table 14). Three impacts do appear to be able to discriminate between the two groups, these being; racial tension, services overused, and other negative effects. The over 35 age group tends to stress other negative effects, while the 35 and under group stress racial tension and services overused.

Again the reader is reminded that the discriminant analysis presented here will select those impacts about which some disagreement between defined groups exist. Impacts mentioned by the majority of people will not appear. The frequency tables and concordance coefficients measure the more universally mentioned impacts.

3.4 Summary of Negative Impact Discriminant Analyses

Discriminant analyses of the negative impacts reveals that men and women disagree on the importance of the need for more jobs and training. Other impacts on which disagreement exists are environmental concern, the boom and bust cycle, and a too short project duration, racial tension, overuse of services, and too much traffic and noise. Women see the social

TABLE 14

Stepwise Discriminant Analysis of Age of Respondent for Negative Project Impacts

Summary Table

Impact	Wilks Lambda	Sig.	Standardized Discriminant Function Coefficients
1. Racial tension	.93	.10	.91
2. Services overused	.83	.03	.90
3. Other negative effects	.81	.04	.42

Canonical Correlation	Wilks Lambda	Significance
.43	.81	.05

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Over 35	Predicted Group Membership: 35 and Under
Over 35	24	14 58.3	10 41.7
35 and under	14	6 42.9	8 57.1

Percent of Grouped Cases Correctly Classified - 55

Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Over 35	.37
35 and under	-.60

impacts such as racial tension as more important. Men tend to rank economic impacts as more important. This social versus economic dichotomy agrees with that found in analyses of the positive impacts.

Breakdown of the respondents by ethnicity shows differences in ranking for six impacts. The six are: the boom-bust cycle, cost-price distortions, racial tension, overuse of services, not enough information, and a negative effect on hunting and trapping.

The native population stress the importance of not enough information and the negative effects on hunting and trapping. Non natives stress the boom-bust nature of the project, and cost-price distortion. The social tension and overused services preferences are not clear.

Seven negative impacts vary in importance for residents of the four communities. The seven are; other negative effects, a negative effect on hunting, environmental concerns, too much alcohol and crime, overuse of services, not enough information about the project, and the project's duration is too short.

Residents of Norman Wells stress the importance of the overuse of services, and not enough project information. Fort Norman residents place greater importance on other negative effects, environmental concerns and to much alcohol and crime. The communities of Wrigley and Fort Simpson rank all the impacts as of medium importance.

The analysis of responses by age group proved to be relatively unfruitful. Both age groups are inconsistent in response making statements about their preferences highly suspect.

4.1 Summary

This report on the analysis of rankings of pipeline project impacts by residents of the four communities along the pipeline route has generated a number of important findings. These findings are listed below.

1. 29% of the respondents found little or no positive impacts from the pipeline.
2. Economic benefits were the most often cited positive benefits.
3. Groups defined by sex, descent, and community seem to be relatively internally consistent in their responses when compared to the sample as a whole.
4. Social problems were the most often cited negative project impacts.
5. Men tend to emphasize economic impacts, while women tend to stress social impacts.
6. The four communities exhibit sufficient uniqueness that they should be considered independently in impact assessment.
7. The use of an open ended non restrictive survey approach has proven to be statistically tractible and generates meaningful results.

This report has been an overview of aggregate patterns concerning project impacts. The data base if expanded can prove to be a significant source for evaluation of socioeconomic impacts related to the Norman Wells Pipeline Project.

5.1 References

Bates, Sheena. 1983. Attitudes Towards the Norman Wells Project. Report No. 2-84 DIAND Norman Monitoring Report Series. University of Saskatchewan, Saskatoon.

Berger, Thomas R. 1977. Northern Frontier/Northern Homeland. The Report of the Mackenzie Valley Pipeline Inquiry. Vols. I and II. Minister of Supply and Services, Ottawa.

Carley, Michael J. 1984. Cumulative Socioeconomic Monitoring: Issues and Indicators for the Beaufort Region. University of British Columbia, Vancouver.

Fort Franklin Hamlet Office. 1982. Fort Norman Preliminary Voters List.

Fort Franklin Hamlet Office. 198;2. Preliminary Voters List. Plebiscite District: Mackenzie Ward Division #1, Wrigley and Fort Simpson Voters.

Fort Franklin Hamlet Office. 1982. Norman Wells Preliminary Voters List.

Fort Simpson Village Office. 1981. Business Licences.

Fort Simpson Village Office. 1983. Business Licences.

GNWT, 1983. Strategic Plan, Department of Renewable Resources.

Hamlet of Norman Wells. 1982. List of all Licensed Businesses in the Norman Wells.

'ang, Reg and Armour, Audrey. 1981. The Assessment and Review of Social Impacts. Federal Environmental Assessment and Review Office, Ottawa.

Mitchell, Bruce. 1979. Geography and Resource Analysis. Longman, New York.

Northwestel. 1982. Western Northwest Territories Phone Book. NWT.

Northwestel. 1984. Western Northwest Territories Phone Book. NWT.

Outcrop Ltd. 1981. NWT Data Book. The North Publishers, Yellowknife.

REAP, 1981. Norman Wells Oilfield Development and Pipeline Project. Report of the Environmental Assessment Panel. Minister of Supply and Services, Ottawa.

9. DIAND MONITORING REPORTS

Interim Report. R.M. Bone, September 1982.

Report 1-83. Norman Wells Project: 1983 Field Activities Report. Robert J. Mahnic and John W. Pomeroy, July 1983.

Report 2-83. Database and Survey Discussions Report. R.M. Bone, July 1983.

Report 3-83. Presentations at the Calgary Workshop: Monitoring the Socio-Economic Impacts of the Norman Wells Project and the Norman Wells Energy Project: A Problem of Monitoring. R.M. Bone, M.B. Green and R.J. Mahnic, August 1983.

Report 4-83. Norman Wells Project: Overview 1983. R.M. Bone, November 1983.

Report 1-84. The DIAND Socio-Economic Monitoring Program: Its Methodology and Data Verification. R.M. Bone, September 1984.

Report 2-84. Attitudes Towards the Norman Wells Project. Sheena Bates, September 1984.

Report 3-84. Analysis of Rankings of Socio-Economic Impacts of the Norman Wells Pipeline Project. M.B. Green and R.M. Bone, October 1984.

Report 4-84. Changes in the Size of the Native Labour Force from 1982 to 1983. Sheena Bates, November 1984.

Report 5-84. The Norman Wells Energy Report: Establishment of Socio-Economic Conditions. M.B. Green and R.M. Bone, March 1984.

Report 6-84. Assessment of Selected Statistical Data from the GNWT. Debra Brown, November 1984.

Report 7-84. Analysis of the Business Sectors of Norman Wells, Fort Norman, Wrigley and Fort Simpson, 1982 to 1983. P.T. Bates, November 1984.

Report 8-84. Impact of the Norman Wells Project on the Economic Base of Norman Wells, Fort Norman, Wrigley and Fort Simpson, 1982 to 1983. P.T. Bates, November 1984.

Report 9-84. DIAND Norman Wells Socio-Economic Monitoring Program: A Three-Year Review. Robert M. Bone, December 1984.

Copies of these reports can be obtained by contacting Norman Wells Project, Department of Indian Affairs and Northern Development, Les Terrasses de la Chaudiére, Ottawa, K1A 0H4.